SECTION 51

MAIN DIESEL ENGINES

51.1 REFERENCES

(51A) **VOLUME V**, *OWNER - FURNISHED EQUIPMENT*

51.2 INTRODUCTION

This Section contains the Contractor Design and Provide general requirements applicable to the Main Engines and their ancillary machinery/equipment and is supplemented by the requirements in other Sections of the Technical Specification.

For WSF Fleet-wide Standardization purposes, End No. 1 of the Vessel shall always be considered the bow, and this designation shall delineate port and starboard, fore and aft wherever they are addressed in the Technical Specification.

51.3 GENERAL

The Propulsion System shall include two (2) skid mounted, 3,000 HP, turbocharged, propulsion diesel engines (Main Engines), with accessory rack, and loose accessories and

auxiliary equipment. These shall be provided by the Propulsion System Integrator (PSI) Contractor in accordance with Reference (51A) and will be Owner - Furnished Equipment (OFE) (*PSI Contractor furnished*) equipment.

The Contractor shall receive and off-load two (2) skid mounted Main Engines and accessory rack assemblies and furnished loose accessories and auxiliary equipment shipped from the Propulsion Vendor. The Contractor shall conduct a thorough inspection, with the WSF Representative and PSI Contractor in attendance, to identify any visible exterior damage to components and submit a written report to the WSF Representative. The units shall then be stored indoors and adequately protected from weather, damage, and deterioration in a heated, dry storage facility until such time as the units can be installed shipboard. Once installed shipboard, all equipment shall be adequately protected from physical damage and adverse environment as set forth in the *SECURITY AND SAFETY* Subsection in Section 1 of the Technical Specification.

See Section 12 of the Technical Specification for heat recovery heating system requirements.

See Sections 56 and 57, respectively, of the Technical Specification for fuel oil and lube oil requirements.

See Section 59 of the Technical Specification for jacket water cooling, SCAC (Separate Circuit After Cooling), and jacket water holding and transfer requirements.

See Section 72 of the Technical Specification for starting air system requirements.

See Section 74 of the Technical Specification for general piping and material requirements and Section 75 of the Technical Specification for insulation and lagging requirements.

The PSI Contractor shall provide all major components, operators and indicators with attached label plates identifying the component and its function. All internal individual wiring shall have floaters attached, individually identifying the wire. Floaters shall include a reference number to the applicable circuit drawing and wire location within the drawing.

51.4 INSTALLATION

Install two (2) OFE (*PSI Contractor furnished*) Main Engine/Skid assembly, together with the accessory rack and attached and detached accessories, local and remote instrumentation, alarms, and controls. Installation shall be in accordance with manufacturer's recommendations and requirements stated in this Technical Specification.

Provide piping, valves, fittings, electrical power, wiring, cabling, connection boxes, foundations and other items and devices not furnished by the PSI Contractor but required to make the Main Engine systems complete, functional, operational, and in full compliance with all Authoritative Agency requirements.

Power for the PSI Contractor-provided Main Engine Electric Pre-Lube Pump, Soak Back Pump, and Layover Heating Pump (all at 480 Vac) shall be from a Contractor–provided Motor Control Center (MCC) located in each Engine Room. Control of these pumps shall be from that space's MCC and from a pushbutton station mounted on each PSI Contractor-provided Main Engine Local Engine Panel (LEP). See **VOLUME V**, OWNER - FURNISHED EQUIPMENT (PSI Contractor's CBS package) for the electrical schematic design and power requirements of the MCC and the interconnecting cabling. See Section 91 of the Technical Specification for additional MCC requirements.

The installation of the Main Engines and ancillary systems shall comply with all applicable Authoritative Agency requirements. All areas or parts that require service, replacement, or periodic maintenance will be readily available and have free access to do the Work required.

The PSI Contractor will provide the RUBBER DESIGN resilient vibration isolation mounts for the Contractor to install under each Main Engine/Skid assembly as required to adequately isolate the Main Engine skids from the Vessel structure. The Contractor will be responsible for installing the resilient isolation mounts together with rigid steel collision chocks.

The resilient isolation mounts shall be installed in a manner which will allow the mounts to be maintained and/or replaced easily.

The Contractor shall adjust the RUBBER DESIGN resilient mounts in accordance with the PSI Contractor's recommendations after jacket water and lubricating oil are at proper operating levels. The resilient mounts shall be fully loaded for at least forty-eight (48) hours prior to beginning the Main Engine to Reduction Gear alignment process.

NOTE: The Contractor shall be wholly responsible for ensuring that the resilient mounts are installed, and adjusted and conform to all the manufacturers and PSI Contractor's installation requirements, and the requirements of this Section of the Technical Specification.

51.4.1 Machinery Jacking Bolts

The Contractor shall design and provide all necessary jacking bolt assemblies attached to the Vessel structure for use in controlled alignment of the Main Engine/Skid assembly, Reduction Gear, and Shafting. The jacking bolt assemblies shall be fabricated and installed with full weld-out, coated to match the surrounding area, and shall remain installed on the Vessel for any future Main Engine/Skid assembly adjustments.

51.4.2 Main Engine Collision Chocks

The Contractor shall design and provide Main Engine collision chocks (four (4) per Main Engine/Skid assembly (two (2) at each end of each Main Engine/Skid assembly)) attached to the Vessel Main Engine foundation structure for use in controlling Main Engine/Skid assembly fore and aft excess movement in the event of a collision. Provide a chock design to

withstand 1.5 times the loaded (wet) weight of the engine/skid assembly. See 46CFR §38.05-2 (e) and §32.63-25. The collision check assemblies shall be designed, fabricated, and installed with full weld-out, and set to allow full motion of the isolators, and the minimum distance of normal fore and aft skid travel without rubbing the chocks. Chock assemblies shall be prepared and coated to match the surrounding area.

51.5 INSTALLATION ASSISTANCE

The PSI Contractor and the WSF Representative will provide the Contractor with on-site technical service and support personnel for the length of time and services as described in Reference (51A) and Section 101 of the Technical Specification. The technical service and support personnel will be to check and test the actual Work done by the Contractor to ensure the installation conforms to the Technical Specification and the PSI Contractor's requirements.

BE ADVISED: The Contract Bid Support Package provides OFE documents and drawings in Reference (51A) that contain specific installation instructions setting forth mandated installation procedures and precautions. The Contractor shall provide designs and installations that, at a minimum, meet and address all instructions and requirements as set forth in the OFE documents and drawings.

In the event the Contractor requires additional service or assistance of the PSI Contractor's representative(s), the Contractor shall arrange for the PSI Contractor's services through WSF. The Contractor shall be responsible to WSF for all such additional costs.

The Contractor shall notify the WSF Representative no less than ten (10) calendar days in advance of the time(s) the PSI Contractor's representative(s) is required on-site. The Contractor shall provide to the WSF Representative a schedule of the anticipated need for the PSI Contractor's representative(s). The schedule shall be based on a normal weekday using day shift working hours. Any and all premium and/or overtime pay required shall be the sole responsibility, of and at the expense of the Contractor.

NOTE: The presence of the PSI Contractor's representative(s) does not relieve the Contractor of the responsibility for proper equipment, component, or system installation and testing. Any work undertaken by the PSI Contractor's representative(s) other than that described herein and in Section 101 of the Technical Specification, shall be done completely at the expense of the Contractor.

51.6 CONTROLS, INSTRUMENTS AND ALARMS

Install the Main Engine control cabinets in close proximity to the accessory racks for the Main Engines, on the same level as the engines(at a deck level of approximately 11'-6"

ABL), in both Engine Rooms. The locations shall be as close as practicable to those indicated in Reference (51A), and approved by the WSF Representative. The intent of this location is to provide close observation of the major pieces of equipment located on the accessory rack, and also to observe cylinder conditions as indicated by snifter outputs during the engine starting sequence. Provide necessary interconnecting tubing, root valves, piping and fittings, hangers and supports, wiring, connection boxes and other items and material not furnished by the PSI Contractor, but required to properly connect installed Main Engine monitoring devices and sensors to the remote Main Engine Control Console in the EOS. The control console is described in Section 99 of the Technical Specification.

All control cable shall be shielded and demonstrated to be inherently immune to electro-magnetic interference (EMI) or radio frequency interference (RFI). Control cable between components provided as OFE in Reference (51A), and procedures for proper installation and termination of control cables, shall be in accordance with the PSI Contractor's recommendations. WSF uses handheld VHF radios in engineering spaces and throughout the Vessel during normal operations. The Propulsion System electronics, controls and control cables must be shielded from the influences of these devices.

The Contractor shall perform checks and calibration of alarms and indicating instruments under the supervision of the PSI Contractor representative who shall be present during the shipboard Main Engine tests, both dockside and during Sea Trials.

51.7 ALIGNMENT

After installation, the Contractor shall verify the alignment of each Main Engine/Skid assembly, Reduction Gear, and Shafting under the supervision and to the satisfaction of the PSI Contractor and the WSF Representative. Record alignment results under both cold and normal operation (hot) temperatures.

No further alignment, measurement, or adjustment to the alignment is to be made without the PSI Contractor's and the WSF Representative's approval and presence.

No welding to the skid will be allowed after the final alignment check has been completed.

Deliver two (2) copies of the final alignment report to the WSF Representative within twenty-four (24) hours of the last engine alignment check and ***prior*** to running any Main Engine. The report shall include, as minimum, coupling flange run-out readings. Alignment tolerances shall be indicated and actual values shall be within the engine manufacturer's allowed tolerances. Any alignment measurements outside the manufacturer's tolerances shall be corrected by the Contractor at no additional cost to WSF.

Alignment shall be coordinated to meet all the requirements of this Section, Section 50, Section 52, and Section 53 of the Technical Specification.

51.8 SPARE PARTS AND INSTRUCTION MANUALS

Provide a list of recommended spare parts and special tools, for those items which are Contractor furnished, together with parts lists and instruction manuals necessary to maintain and service provided equipment and accessories in accordance with the requirements of Sections 86 and 100 of the Technical Specification.

51.9 TESTS, TRIALS AND INSPECTIONS

Tests and/or Trials shall be provided in accordance with this Section, Section 101 of the Technical Specification, Reference (51A) and the PSI Contractor's requirements.

Inspections shall be performed as defined in this Section and in Section 1 of the Technical Specification.

51.10 PHASE II TECHNICAL PROPOSAL REQUIREMENTS

The deliverables required by Section 100 of the Technical Specification and the Authoritative Agencies, shall be provided during the Phase II Technical Proposal stage of Work in accordance with the requirements of Section 100 of the Technical Specification.

51.11 PHASE III DETAIL DESIGN AND CONSTRUCTION REQUIREMENTS

The deliverables required by Section 100 of the Technical Specification and the Authoritative Agencies, shall be provided during the Phase III Detail Design stage of Work in accordance with the requirements of Section 100 of the Technical Specification.

(END OF SECTION)